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## Varietal evaluation of African marigold (*Tagetes erecta*) under Prayagraj agroclimatic conditions

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### Abstract

The present investigation was carried out under open field in Department of Horticulture, SHUATS, Prayagraj, during February, 2021 to May, 2021. The experiment was laid out in Randomized Block Design (RBD) with three replications. Ten different varieties of marigold were evaluated in an investigation. The results revealed that the maximum plant height (102.8 cm), number of leaves (379), number of primary branches (22) were observed in the variety Patula Bonenza Bolero. However, minimum days to first flower bud initiation (26), days to first flowering (33), days to 50 percent flowering (38), was observed in the variety Sweet Cream. Significantly longer flowering duration (66 days) and shelf life (7 days) were observed in Dubloon and Patula Bonenza Bolero, respectively. Also the economic parameters i.e Benefit: Cost ratio, Gross return and Net return were significantly higher in the variety Patula Bonenza Bolero.

**Keywords:** maximum, observed, significantly, varieties, yield

### Introduction

Among different loose flowers, marigold occupies the top most position and is highly valued for its spectacular flower, brilliant color, delightful appearance, myriads of size, shapes, forms, fragrance, keeping quality and is endowed with the large spectrum of commercial potentialities in medicinal and industrial sector. Marigold is an ornamental plant belonging to the family Compositae. and are native to Mexico and Guatemala. Presently this flower is growing mainly in India, Tropical Africa, Sri Lanka, and Madagascar. Farmers grow local varieties without knowing the yield potential and quality. There are several varieties released in different states with many desirable characteristics, high yield potential, and better-quality parameters. The demand for uniform, medium sized, compact bright color flowers with more shelf life are very high in domestic flower market. Many varieties of African marigold have been evolved which show variation in the height of the plant and shape and size of the flowers. The flowers of African marigold have large yellow or orange flower heads, the color of flower varies from light yellow to creamy yellow, golden yellow, bright yellow, cadmium yellow, cadmium orange, deep orange, Sulphur sunflower yellow and white. Leaves are strongly scented and pinnately divided, and leaflets are lanceolate and serrated. Flowers are single to fully double with large-size globular heads. They also have larger flowers that can be up to 6 inches (15 cm.) in diameter. If deadheaded regularly, African marigold plants will usually produce many large blooms. These flowers are the spend thrifts among annuals, bringing a wealth of gold, copper, and brass into our summer and autumn gardens. The flower's popularity probably derives in part from its ability to bloom brightly all summer long. It is highly suitable as a bedding plant purpose in an herbaceous border and is also ideal for newly planted shrubberies to provide colour and to fill the space. It has been reported that marigold cultivation keeps the population of nematodes under control. It is also used as trap crop. As it is short duration crop with low investment, it becomes popular crop of India. Flowers of African marigold can be used for extraction of 1-lemoene, Eocene, 1- linylaetate, 1-linauol. An extract obtained from the flowers is mixed with other ingredients in the preparation of an obtained which is used in curing ulcer.

### Materials and Methods

#### Experimental site

The experiment was carried out in naturally ventilated poly house of Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Science, Prayagraj which is situated in the agro climatic zone (subtropical

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belt) of Uttar Pradesh. All types of facilities necessary for cultivation of successful crop including inputs, irrigation facilities and labors were provided by the Department of Horticulture.

### Geographical location of the experimental site

Geographically Prayagraj is situated on the 25.45°N latitude and 81.84°E longitude in the southern part of the Uttar Pradesh at an elevation of 98 meters of main sea level and stands at country.

### climatic condition of the experimental area

The area of Prayagraj district comes under subtropical belt in the South East of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature reaches upto 46°C – 48°C and seldom falls as low as 4 °C – 5 °C. The relative humidity ranges between 20 to 94 percent. The average rainfall in this area is around 1013.4 mm annually.

### Experimental Details and Design

Experimental details

The other details are given below	
Experimental Design	: RBD (Randomized Block Design)
Total number of varieties	:10
Replications	:3
Total number of plots	:30
Plant spacing	:40 cm X 40 cm
Number of plants in each plot	:9
Number of plants per variety	:27
Total number of plants	:270
Plot size	:1.2 m X 1.2 m
Width of main irrigation channel	:1.0 m
Width of sub irrigation channel	:0.5 m
Width of bunds	:0.3 m
Total length of area	:15.3 m
Total width of area	:6.1 m
Net cultivated area	:43.2m <sup>2</sup>
Gross cultivated area	:93.3m <sup>2</sup>

#### Planting material used

Seedlings was used as the planting material.

#### Varieties used for the experiment

The varieties used for the experiments are as follows:

1. Whooper Yellow
2. Patula Bonanza Bolero
3. Monstruck
4. Antigua Orange
5. Dubloon
6. Discovery Orange
7. Patula Safari Bolero
8. Colossus
9. Sweet Cream
10. Cotton Red

### Result and Discussion

#### Plant height(cm) at 30, 60 days after planting

The varieties differed significantly with respect to height of the plant at 30 and 60 days after planting. The taller plants (102.8) were observed in Patula Bonanza Bolero V<sub>2</sub>, which was followed by variety Antigua Orange (V<sub>4</sub>, 60.7cm) and the shorter plants were observed in the variety Sweet Cream (V<sub>9</sub>,

26.9cm)

Similar findings were also reported by Bharti and Jawahar (2014) <sup>[5]</sup> in the work done by them in an evaluation trial of African marigold, where the plant height of the variety Littleduck was found highest and significantly different from each other, also the variety Dubloon showed with the shortest plant height in an evaluation trial.

The varieties interacted with environment and exposed the phenotypical expressions on the plant height might be the reason behind the variation reported amongst the varieties. The plant height was recorded differently in various varieties at different intervals and this difference in plant height might be due to the genetic make-up of the varieties.

#### No. of leaves

Significant difference was found among the different varieties at 30 and 60 days. most number of leaves (379) were observed in variety Patula Bonanza Bolero V<sub>2</sub> which was followed by Patula Safari Bolero (V<sub>7</sub>, 355) while fewer number of leaves were recorded in Whooper Yellow (V<sub>1</sub>, 252).

Similar findings were observed by Beniwal and Kumari (2006) <sup>[4]</sup> in their experiment on varietal evaluation of marigold they revealed that their result has shown the maximum number of leaves in the variety Narangi and when compared to all the different varieties of marigold the variety Bounty and Hero Orange showed significantly lesser number of leaves and are significantly different from each other.

#### No. of primary branches

Significant difference was found among the different varieties at 30 and 60 days, more number of primary branches (22) were observed in variety Patula Bonanza Bolero V<sub>2</sub>, which was followed by Dubloon (V<sub>5</sub>, 17) while lesser number of primary branches were observed in Sweet Cream (V<sub>9</sub>, 5).

In an evaluation trial of chrysanthemum it was found that different varieties of chrysanthemum showed significantly different results as the variety Red Bronze showed maximum number of branches whereas the variety pink bloom showed significantly lesser number of primary branches, and was observed by Mohan Khanvilkar (2008) <sup>[11]</sup> in its experimental studies on chrysanthemum.

#### Days to first flower bud initiation

There was significantly difference in among the varieties respectively in the first flower bud initiation it was found that lesser number of days to first flower bud initiation (26) were observed in variety Sweet Cream V<sub>9</sub>, which was followed by Colossus V<sub>8</sub>, 32 while the more number of days were observed in Moonstruck V<sub>3</sub>,88.

Similar report has been reported by Saraladevi *et al.* (2003) <sup>[6]</sup> when she worked on varietal evaluation of acid lime and showed significant difference in the days to first flower bud initiation in different varieties of acid lime. The variety Sai Sarbati showed lesser number of days to first flower bud initiation whereas the variety Rangpur showed significantly more days to first flower bud initiation as compared to the other varieties.

#### Days to first flowering

There was significantly difference among the varieties respectively in the first flowering it was found lesser number of days to first flowering (33) were observed in variety Sweet

Cream V<sub>9</sub>, which was followed by Collosus (V<sub>8</sub>, 39) while the more days were observed in Moonstruck (V<sub>3</sub>, 97).

In an evaluation trial of varietal evaluation of china aster the significant difference in the days to first flowering has been noticed as the variety Starlight Mix showed lesser number of days to first flowering whereas the variety Sonata showed significantly more number of days as compared to the other varieties, as been observed by Munikrishnappa *et al.*, (2013) [17]

#### Days to 50 percent flowering

There were significant differences among the varieties respectively in the 50 percent flowering it was found that lesser number of days to fifty percent of flowering (38) were observed in variety Sweet Cream V<sub>9</sub>, which was followed by Collosus (V<sub>8</sub>, 43) while more number of days were observed in Moonstruck (V<sub>3</sub>, 114).

Similar report has been reported by Bishwas *et al.* (2007) they worked on varietal evaluation of chrysanthemum and showed significant difference in the days to fifty percent flowering in different varieties of chrysanthemum, the studies showed that the variety Ajay took lesser number of days to fifty percent flowering in chrysanthemum, whereas the variety Swarna showed more number of days taken to fifty percent of the flowering, Patil *et al.* (2007) [21] also proved the findings mention above in its research on chrysanthemums.

#### Flowers per plant

The data with reference to total number of flowers per plant. it was found to be significant differences among the varieties. However, most number of flowers per plant (50) were observed in variety Patula Bonenza Bolero V<sub>2</sub>, which was followed by Antigua Orange (V<sub>4</sub>, 48) while fewer number of flowers were observed in Sweet Cream (V<sub>9</sub>, 27).

Similar report has been reported by Yogi Tejaswani (2009) who worked on varietal evaluation of Gerbera and showed significant difference in the flowers per plant in different varieties of Gerbera. The studies showed that the variety Sunway has shown maximum number of flowers per plant whereas the variety Pricilla showed significantly lesser number of flowers.

#### Flowering duration (days)

It was observed that the flowering duration of each variety is significantly different from other. The most number of days to flowering duration (66) was observed in variety Dubloon V<sub>5</sub>, which was followed by Discovery Orange (V<sub>6</sub>, 50), while fewer number of days to flowering duration was observed in the variety Patula Bonenza Bolero (V<sub>2</sub>, 39).

The flowering duration has been found significantly different from each variety also observed by Sagnekar *et al.* (2013) they worked on varietal evaluation of African marigold and showed significant difference in the flowering duration as the variety Pusa Basanti Gaiinda showed maximum number of days to flowering duration whereas the variety Antigua Orange showed significantly lesser number of days to flowering duration.

#### Shelf life (days)

Shelf life of flower was ascertained and the data obtained reveal that longer shelf life period (7) was recorded in the variety Patula Bonenza Bolero V<sub>2</sub> at par Dubloon V<sub>5</sub> and Sweet Cream (V<sub>9</sub>, 6), while Whooper Yellow V<sub>1</sub> exhibited shortest shelf life.

The shelf life of different varieties has been found significantly different from each other also observed by Singh and Kumar *et al.* (2001) they worked on varietal evaluation of tuberose and showed significant difference in the shelf life as the variety Shrinagar showed best results in the shelf life with the maximum of it whereas the variety Vaibhav showed significantly lesser number of days or shortest shelf life.

#### Flower yield per plant (g)

The data flower yield per plant was recorded as different varieties of marigold. higher flower yield per plant (212.53g) were observed in variety Patula Bonenza Bolero V<sub>2</sub>, which was followed by Antigua Orange (V<sub>4</sub>, 206.93g) while the lesser yield was observed in Sweet Cream (V<sub>9</sub>, 31.63g).

The flower yield per plant has been found significantly different from each variety also observed by Ahmad *et al.* (2017) [2] they worked on varietal evaluation of marigold and showed significant difference in the flower yield per plant as the variety Golden Gate and Moonsong Deep Orange showed higher flower yield whereas the variety Rubber Glove showed significantly lesser yield.

#### Flower yield per plot (kg)

The data flower yield per plot was recorded as different varieties of marigold. Significantly higher yield per plot (4.24kgs) was observed in the variety Patula Bonenza Bolero V<sub>2</sub> which was at par by Antigua Orange (V<sub>4</sub>, 4.31kgs) while the lesser yield was observed in Sweet Cream (V<sub>9</sub>, 1.17kgs).

The flower yield per plot has been found significantly different from each variety also observed by Piyush *et al.* (2000) [22] they worked on varietal evaluation of jasmine and showed significant difference in the flower yield per plot, the varieties like Gundumalli and Double Mogra showed good yield in the experiment whereas the variety Sambac showed significantly lesser yield as compared to the other varieties of jasmine.

#### Flower yield per hectare (q/h)

The data flower yield per plot was recorded as different varieties of marigold is presented in (Table 4.12, Fig 4.12). Significantly higher yield per hectare (47.13q) was observed in the variety Patula Bonenza Bolero V<sub>2</sub> which was at par by Antigua Orange (V<sub>4</sub>, 47q) while the lesser yield was observed in Sweet Cream (V<sub>9</sub>, 12.98q) A research trial has been conducted by Rao and Reddy (2005) [24] on varietal evaluation of African marigold and significant results have been obtained as the variety Marigold Bonanza showed good flower yield per hectare whereas the variety Cotton Red showed significantly lesser yield per hectare as compared to the other varieties in an evaluation trial.

#### Economic parameters

The economics of different varieties viz. cost of cultivation (rs/ha), gross return, net return, benefit cost ratio has been worked out.

The higher gross return (Rs. 7,06,983/ha) was observed in the variety Patula Bonenza Bolero V<sub>2</sub>. while the least gross return was observed Sweet Cream V<sub>9</sub>, Rs.1,94,917/ha.

The higher net return (Rs. 6,31,983/ha) was observed in the variety Patula Bonenza Bolero V<sub>2</sub>, while the least net return was observed in Sweet Cream V<sub>9</sub>, Rs. 1,19,987/ha.

The higher net benefit cost ratio (8:4) was observed in the variety Patula Bonenza Bolero V<sub>2</sub>, while least was observed in Sweet Cream (V<sub>9</sub>, 1:6).

**Table 1:** Cost of Cultivation of different varieties of marigold.

S. No	Particulars	Unit	Quantity	Rate/Unit (Rs)	Amount (Rs)
<b>A</b>	<b>Land preparation</b>				
I.	Ploughing with MB plough	Hrs	3	960	2880
II.	Disc harrowing	Hrs	3	780	2340
III.	Planking and levelling	Hrs	4	660	2640
IV.	Layout	Labour	6	500	3000
<b>B</b>	<b>Manures and Fertilizers</b>				
I.	Neem + Urea	Kg	27	300	8100
II.	SSP	Kg	25	260	6500
III.	MOP	Kg	83	320	26560
IV.	Application charges	Labour	3	700	2100
<b>C</b>	<b>Irrigation</b>				
I.	Irrigation charges		20	100	2000
II. S	Labor charges	Labour	6	300	1800
<b>D</b>	<b>Plant protection</b>				
I.	Hand weeding	Labour	14	114	1600
II.	Insecticides and Pesticides				
III.	Spray of chemicals	Labour	3	500	1500
<b>E</b>	<b>Harvesting</b>				
I.	Labor charges	Labour	4	600	2400
II.	Rental value of land			5000	5000
	Common cost cultivation				68,420

**Table 2:** Gross return (Rs/ha), Net return (Rs/ha), Benefit : Cost ratio of different varieties of marigold

Varieties	Cost of Cultivation	Gross	Net	B:C
Whooper Yellow	75000	408633	333633	4.4
Patula Bonenza Bolera	75000	706983	631983	8.4
Monstruck	75000	537600	462600	6.2
Antigua Orange	75000	718383	643383	8.6
Dubloon	75000	648767	573767	7.7
Discovery Orange	75000	223567	148567	2.0
Pohila Sagari Bolero	75000	564467	489467	6.5
Colossus	75000	316467	241467	3.2
Sweet Cream	75000	194917	119917	1.6
Cotton Red	75000	339567	264567	3.5

### Conclusion

Based on the findings of this experiment, it is concluded that the variety Patula Bonenza Bolero gave significant result for plant height, no. of leaves and no. of primary branches, flowers per plant, flower yield per plant and shelf life, Whereas the variety Sweet Cream showed significant results for bud initiation, first flowering and fifty percent flowering. The variety Patula Bonenza Bolero also showed significant result for gross return, net return and cost benefit ratio. Therefore, we can recommend Patula Boenza Bolero and Sweet Cream as a significant variety for flowering and economic parameters respectively to be grown under the Prayagraj agroclimatic condition.

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